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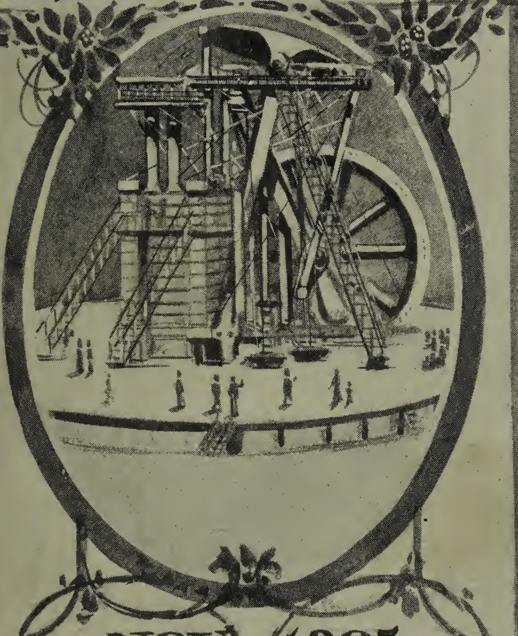
A SHORT STORY of GEO. H. CORLISS



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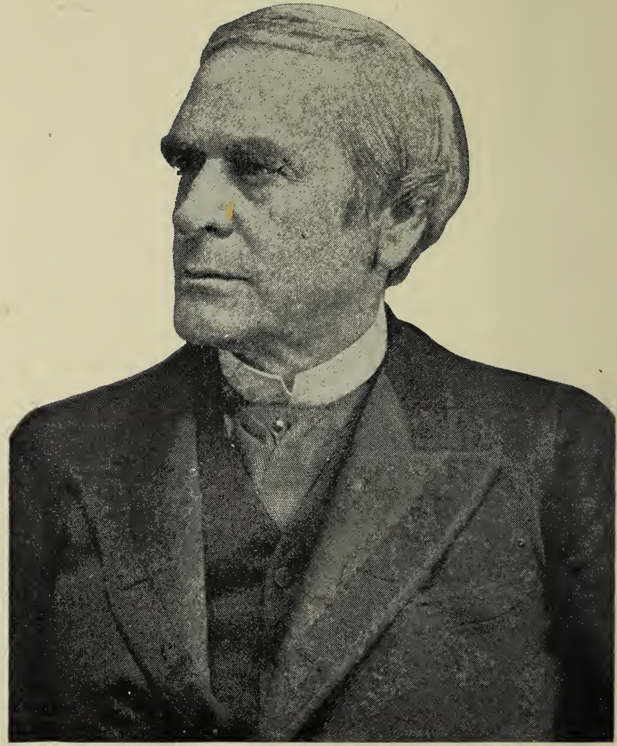

GEORGE H. CORLISS.

Presented by
E. K. Hill Esq.
Corliss Steam Engine Works.

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THE name of Watt easily takes the place of first importance in the history of the steam engine — and probably the name of George H. Corliss would, by general consent, be given the second place. The importance of his inventions, and the excellence of his engineering achievements, is remarkable when we consider how little his inheritance and his early associations contributed to that end.

His father was a country physician—rather noted for his surgical skill, which probably explains the mechanical instincts of his son George.

George was born in 1817 at Easton, Washington County, New York. He had a good country school education, and attended an academy at Carleton, Vt. for a time. In after years he related that he studied the elements of algebra while watching with a gun, for a wood-chuck to come out of his hole. In 1837 he was clerking in a country store at Greenwich, N. Y., during which time an indication of his mechanical and executive ability showed itself. A spring freshet carried away the only convenient bridge. The local builders declared it impossible to erect even a temporary bridge for weeks to come. Young Corliss constructed an emergency bridge in ten days at an expense of only fifty dollars. This

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country store was in connection with one of the early cotton factories, and part of his work was to measure the cloth from the mill. It was a place of considerable responsibility, for young Corliss apparently had the entire charge of this and of selling all sorts of goods "on account." The next year he opened a country store of his own, but soon tired of it and sold out in less than a year.

Up to this time he had not seen the inside of a machine shop, and had no especial interest in that direction. It must have been very soon after, however, that he became interested in the possibility of constructing a sewing machine. He invented one and secured a patent in 1842. This was some years before Howe secured his patent. Corliss' device passed needles and thread through in opposite directions at the same time. To perfect this invention and to arrange for the construction, Corliss went to Providence in 1844. The Company to whom he went—Fairbanks, Bancroft & Co.—then doing a machine and engine business, were not long in recognizing his talent, and in persuading him to drop for a time his sewing machine, and enter their employ as a draftsman on engine designs. Within a year he was admitted to the firm, and within two years he had made the invention that revolutionized the construction of steam engines. Corliss was at this time, 1846, only 29 years of age. In 1848 he entered into a partnership under the name of Corliss, Nightingale & Co., and this company built the first engine embodying these improvements. This company was incorporated in 1856 as The Corliss Steam Engine Co. His original patent was dated 1849, but was re-issued in 1851 and again in 1859.

Hitherto all engines were controlled by a throttle valve that could only be varied in its operation by hand. As such a valve was necessarily some distance from the cylinder, the waste of steam was considerable, and it was impossible to operate it quickly enough to cut off steam during a part of a stroke. Mr. Corliss' invention was the combination of a regulator with a liberating valve gear and sliding valves. It did away with the wasteful throttle valve, placed the valves close to the cylinder, automatically opening and closing them, within limits, at any point of the stroke, thus allowing the steam to be used expansively. The first one constructed was a beam engine with a diameter of 30 in., stroke of 6 ft. and indicated 260 H. P. It had four flat slide valves, the two upper for supply and the two lower for exhaust.

The transmission was by rods and toothed segments from a central disc operated by a crank and rod from an eccentric on the engine shaft. The cut-off was controlled by a trip operated from the governor and adjustable within limits at pleasure and automatically by the governor. When the catch was thrown out the valves were closed by weights with a dash pot to prevent excessive jar. This device permits the valve motion to act rapidly while opening and closing a port, and yet to move slowly in approaching the port and after it is well opened, thus securing ample port openings, permitting full admission and very slight frictional resistance. The construction of this engine was followed by two others of the same size and all were so successful that land was purchased and extensive works erected.

The second type substituted cylindrical for flat slide valves, which have since been characteristic of all of the

Corliss valve gear. They were first used on a horizontal engine built in 1850.

The third type was designed in 1851 or 1852. It has cylindrical valves operated by rods from the central reciprocating disc. The trips were the well known "Crab Claw" and weights were used to close the valves.

This was the type first known in Europe and was the starting point for all later variations. In 1858 he invented a fourth valve gear which was not patented, and which is now seen in what is known as the Harris-Corliss type. The difference was in the manner of tripping the cut-off and the working of the valve lever.

A fifth type was exhibited for the first time at the Paris Exhibition of 1867. The fundamental construction was the same, but in detail the mechanism was entirely new. The most noticeable innovation was the substitution of springs for weights in closing the valves. This was really patented as early as 1859 but became generally known only after the Paris Exhibition.

A sixth form was designed in 1874 and 1875. The valves were closed by atmospheric pressure, weights or springs being no longer used. The reciprocating disc was centrally placed, but the operating rods were mounted in pairs, using two pins, instead of four, as formerly.

There was a seventh variation also but it was relatively unimportant, except that the disengagement was more exact and certain.

In 1880 an eighth valve-gear was designed and put on the market. This is known as the "wrist-lever type" of valve-gear.

Mr. Corliss anticipated the demand for higher piston speeds and saw that this would necessitate larger port

openings, in order to get the highest efficiency from the steam. To get the full benefit of the larger port openings, it was necessary to operate the steam and exhaust valves much more rapidly than in the valve-gears in general use. This he accomplished by his improved wrist-lever type of gear, which he designed and built in 1885 and 1886. This, without question, was the best and most efficient Corliss type of valve-gear and is still exclusively used on the Corliss engines built at the original Corliss Works.

This invention of the automatic cut-off was a far reaching improvement. It so approved itself that the Corliss principle is seen in a majority of the steam engines built since his day. It was found to be extraordinarily satisfactory and economical. Mr. Corliss himself had such faith in it from the beginning that he did not hesitate to accept in payment for his engines a proportion of the guaranteed savings in coal consumption. Some of his guarantees seemed wildly extravagant, but he was always able to do better than he promised, and usually to his financial advantage.

Mr. Phillips, an old associate of Mr. Corliss, gives several instances of such guarantees:

"In 1855 he put an engine and boilers into the James Steam Mill at Newburyport, Mass., the price for engine and boilers to be five times the amount of coal saved in one year. The old engines, which were 24 x 48 (condensing developing about 180 H. P.) used on an average for the five years preceding Mr. Corliss' contract, 10,483 lbs. of coal per day, and were fair examples of the engines in use before Mr. Corliss' time.

The new engines were found to use but 5,690

pounds per day, making a saving in a single year of $3,946.84, coal being reckoned at $6.00 per ton, mrking the total price paid to Corliss & Nightingale for a 180 H. P. condensing engine and boilers, $19,734.22."

"In 1856 a new engine was put into the Ocean Steam Mills in Newburyport, Mass., Mr. Corliss agreeing to take the old engines (which previous to this were considered by the owners first-class machines) and the saving of fuel in two and one-half years, or the sum of $3,000 cash. The Mill Company decided (having doubtless in mind the experience of their neighbor, the James Steam Mill) to pay the $3,000, a wise decision, as the saving amounted to that in two years."

"In 1852 a new engine was put into the rolling mill of Crocker Brothers & Co. in Taunton, Mass., guaranteeing to do one-third more work than the old engine was doing, and when five tons of coal was used per day, but two tons should be used to do the same work. Forfeit $1.00 per pound for every pound per day used above that amount. Another contract which sounds hazardous but which shows the faith which Corliss and his partners had in the engine, was that made with the Washington Mills at Gloucester, N. J., wherein they agreed to put in an engine of about 200 H. P. for the sum of $7,100.00 and forfeit $5,000.00 for each ton per day of coal above four tons which should be used in driving the mill. This contract was entered into knowing that about nine tons per day were used with the old engines."

DWIGHT GODDARD.

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(To be concluded.)

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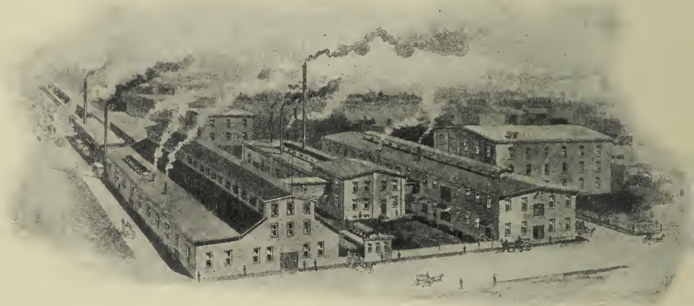

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